Gulf Cooperation Council

EDICT OF GOVERNMENT

GSO 40 (2010) (English): MOTOR VEHICLES - IMPACT STRENGTH (Draft Standard)

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هيئة التقييس لدول مجلس التعاون لدول الخليج العربية
GCC STANDARDIZATION ORGANIZATION (GSO)

مشروع: نهائي

GSO2/1/FDS/GSO 40 : 2010

السيارات – تحمل الصدمات
MOTOR VEHICLES - IMPACT STRENGTH

تحديث

اللجنة الفنية الفرعية الخليجية لقطاع مواصفات المركبات والإطارات

هذه الوثيقة مشروع لمواصفة قياسية خليجية تم توزيعها لإبداء الرأي والملحوظات بشأنها، لذلك فإنها عرضة للتغيير والتبديل، ولا يجوز الرجوع إليها كمواصفة قياسية خليجية إلا بعد اعتمادها من مجلس إدارة الهيئة.

تقديم

هيئة التقييس لدول مجلس التعاون لدول الخليج العربية هيئة إقليمية تضم في عضويتها الأجهزة الوطنية للمواصفات والمقاييس في دول الخليج العربية ، ومن مهام الهيئة إعداد المواصفات القياسية الخليجية بواسطة لجان فنية متخصصة .

وقد قامت هيئة التقييس لدول مجلس التعاون لدول الخليج العربية ضمن برنامج عمل اللجنة الفنية رقم٢-١ " اللجنة الفنية الخليجية الفرعية لقطاع مواصفات المركبات والإطارات " بتحديث المواصفة رقم " GSO2/1/FDS/GSO 40: 2010 " السيارات تحمل الصدمات من قبل مملكة البحرين وقد تم تحديث المشروع بعد استعراض المواصفات القياسية العربية والأجنبية والدولية والمؤلفات المرجعية ذات الصلة.

وقد اعتمدت هذه المواصفة كلائحة فنية خليجية في اجتماع مجلس إدارة الهيئة رقم ( )، الذي عقد بتاريخ / / هـ ، الموافق / / م.

Foreword

Standardization Organization for GCC (GSO) is a regional Organization which consists of the National Standards Bodies of GCC member States. One of GSO main functions is to issue Gulf Standards /Technical regulation through specialized technical committees (TCs).

GSO through the technical program of committee TC No. 2-1 " The Gulf technical Subcommittee for vehicles and tyres standards " has reviewed this Standard No. "GSO2/1/FDS/GSO 40: 2010 MOTOR VEHICLES - IMPACT STRENGTH" . The Draft Standard has been prepared by Kingdom Of Bahrain .

The draft Standard has been prepared based on relevant ADMO, International and National foreign Standards and references.

This standard has been approved as Gulf Standard by GSO Board of Directors in its meeting No..../.... …….held on / / / H , / / G

MOTOR VEHICLES - IMPACT STRENGTH

1- SCOPE AND FIELD OF APPLICATION

This standard is concerned with the strength of passenger cars, multi-purpose passenger vehicles, trucks and buses to withstand impacts.

2- COMPLEMENTARY REFERENCES

2.1 GSO 36/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 1: Frontal Impact”.

2.2 GSO 37/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 2: Moving Barrier Rear Impact”.

2.3 GSO 38/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 3A: Side Impact”.

2.4 GSO 1707/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 3B: Moving Barrier Side Impact”.

2.5 GSO 1708/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 3C: Moving Barrier Side Impact”.

2.6 GSO 39/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 4: Roof Strength”.

3- DEFINITIONS

3.1 Passenger car: A motor vehicle with a motive power, except a multi-purpose passenger vehicle, designed to carry nine persons or less including the driver.

3.2 Multi-purpose passenger vehicle: A motor vehicle with motive power, designed to carry nine persons or less which is constructed either on a truck chassis or with special features for occasional off-road operation.

3.3 Truck: A motor vehicle intended for carrying goods, it may also tows a trailer.

3.4 Bus: A motor vehicle intended for carrying persons and luggage, and which has more than nine seating places including the driver seat.

3.5 Fixed impact barrier: A fixed block of reinforced concrete, prepared for the frontal impact test.

3.6 Moving impact barrier: A steel construction, moving on four wheels, prepared for the rear and side impact test.

3.7 Kerb load of vehicle: The weight of the vehicle with usual standard equipment, maximum capacity of engine fuel, oil, and coolant, the spare wheel, and (if so equipped) the air conditioning system.

3.8 Passenger compartment: The space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing and front bulkhead and the plane of the rear compartment bulkhead or the plane of the rear-seat back support.

3.9 "R" point: A reference point defined for each seat by the manufacturer in relation to the vehicle's structure.

3.10 Transverse plane: A vertical plane perpendicular to the median longitudinal plane of the vehicle.

3.11 Longitudinal plane: A plane parallel to the median longitudinal plane of the vehicle.

3.12 Protective system: The interior fittings and devices intended to restrain the occupants and contribute towards ensuring with the requirements set out in this standard.

3.13 "H" point: A reference point determined for each seat by the testing service responsible for approval.

4- REQUIREMENTS

To be able to withstand impacts, the motor vehicles shall meet the following:

4.1 Frontal Impact

4.1.1 Steering Displacement

4.1.1.1 The upper end of the steering shaft for passenger cars, multi-purpose passenger vehicles, trucks and buses with GVW less than 4500 kg with an unloaded weight of less than 2500 kg, shall not be displaced by more than 127 mm horizontally rearward, and parallel to the longitudinal axis of the vehicle, relative to an undisturbed point on the vehicle which is not affected by the frontal impact, at an impact speed of 48.3 km/h with the fixed impact barrier.

4.1.1.2 The requirements of item 4.1.1 shall not apply if the vehicle complies with the requirements of item 4.1.2.1.11. Similarly, the requirements of item 4.1.2.1.11 shall be deemed to be met if the requirements of item 4.1.1.1 are fulfilled.

4.1.2 Dummy and Vehicle Performance Criteria (Dummy test A or B)

At the end of the frontal impact to the passenger vehicle or multi purpose passenger vehicle, in either case with GVW up to 2500 kg (M_1 < 2.5T) the following performance criteria shall be met in either Dummy test A or Dummy test B:

4.1.2.1 Dummy test A

4.1.2.1.1 The head performance criterion (HPC) shall not exceed 1000.

4.1.2.1.2 The resultant head acceleration shall not exceed 80 g for more than 3 ms.

4.1.2.1.3 The neck injury criterion (NIC) shall not exceed 3.3 KN (Figures 1 and 2).

4.1.2.1.4 The neck bending moment about the y axis shall not exceed 57 Nm in extension.

4.1.2.1.5 The thorax compression criterion (THCC) shall not exceed 50 mm.

4.1.2.1.6 The viscous criterion (VC) for the thorax shall not exceed 1.0 m/s.

4.1.2.1.7 The femur force criterion (FFC) shall not exceed 9.07 KN as shown in fig. 3.

4.1.2.1.8 The tibia compression force criterion (TCFC) shall not exceed 8 KN.

4.1.2.1.9 The tibia index (TI) measured at the top and bottom of each tibia shall not exceed 1.3 at either location.

4.1.2.1.10 The movement of the sliding knee joints shall not exceed 15 mm.

4.1.2.1.11 Residual steering wheel displacement, measured at the centre of the steering wheel hub, shall not exceed 80 mm in the upwards vertical direction and 100 mm in the rearward horizontal direction.

4.1.2.1.12 If there is continuous leakage of liquid from the fuel-feed installation after the collision, the rate of leakage shall not exceed 5×10^{-4} kg/s; if the liquid from the fuel feed system mixes with liquids from the other systems and the various liquids cannot easily be separated and identified, all the liquids collected shall be taken into account in evaluating the continuous leakage.

4.1.2.1.13 No door shall open during the test.

4.1.2.1.14 No locking of the locking systems of the front shall occur.

4.1.2.1.15 After the impact, it shall be possible without the use of tools except for those necessary to support the weight of the dummy.

4.1.2.1.15.1 To open at least one door, per row of seats to allow the evacuation of all the passengers. This shall however, be applicable only to vehicles having a roof of rigid construction.

4.1.2.1.15.2 To remove the dummies from the vehicle.

4.1.2.2 Dummy test B

4.1.2.2.1 The head performance criterion (HPC) shall not exceed 1000 .

4.1.2.2.2 The resultant acceleration calculated from the output of the thoracic instrumentation shall not exceed 60 g, except for intervals whose cumulative duration is not more than 3 milliseconds.

4.1.2.2.3 Compressive deflection of the sternum relative to the spine shall not exceed 76 mm.

4.1.2.2.4 The force transmitted axially through each upper leg shall not exceed 10 kN.

4.1.2.2.5 The spillage liquid (replacing the fuel) from the fuel system and/or tank, from the moment of impact to cessation of motion of the tested vehicle, shall not exceed 28 grams. In the 5 minutes period immediately following cessation of motion, the spillage shall not exceed 142 grams. For the subsequent 25 minute period, fuel spillage during any one minute interval shall not exceed 28 grams.

4.1.2.2.6 All portions of the test dummy shall be contained within the outer surfaces of the vehicle passenger compartment throughout the test.

4.1.2.2.7 Retain 50% of windshield periphery on each side of the vehicle centerline.

4.1.2.2.8 No intrusion of the occupant compartment by vehicle parts during the test.

4.2 Fuel Leakage

The spillage liquid (replacing the fuel) from the fuel system and/or tank, from the moment of rear impact (Test procedure A) with speed 48.3 km/h to cessation of motion of the tested vehicle, shall not exceed 28 g. In the 5 minutes period immediately following cessation of motion, the spillage shall not exceed 142 grams. For the subsequent 25 minute period, fuel spillage during any one minute interval shall not exceed 28 grams.

4.3 Rear Impact

Vehicles must meet either item 4.3.1 or 4.3.2 or 4.3.3, below.

4.3.1 When tested to Test Condition (A), passenger cars, multi-purpose passenger vehicles, trucks and buses having a GVW less than 4500 kg must meet item 4.2 above.

4.3.2 When tested to Test Condition (B), passenger cars and multi-purpose passenger vehicles, and (at the manufacturer's choice) trucks and buses, having a GVW less than 4500 kg must meet the following requirements:

4.3.2.1 The amount of longitudinal displacement of the vertical projection of the floor of the R-point of the vehicle's rearmost seat in relation to a reference point on a non-deformed part of the vehicle structure shall be less than 75 mm when impacted by the Moving Barrier Impactor at a speed of 35 km/h.

4.3.2.2 At the end of rear impact on the vehicle the following performance criteria shall be met:

4.3.2.2.1 No rigid component in the passenger compartment shall constitute a risk of serious injury to the passengers.

4.3.2.2.2 The side doors of the vehicle shall not open under the effect of the impact.

4.3.2.2.3 The opening of doors to enable all the passengers to emerge shall be possible without the use of tools.

4.3.2.2.4 The requirements of item 4.1.2.12 (fuel leakage) shall be met.

4.3.3 When tested to Test Condition (C), passenger cars, multi-purpose passenger vehicles, trucks and buses having a GVW less than 4500 kg must meet item 4.2 above.

4.4 Side Impact

Depending on the vehicle applicability shown in items 4.4.1, 4.4.2 and 4.4.3 vehicles shall meet the requirements of item 4.4.1 and the requirements of either item 4.4.2 or item 4.4.3.

4.4.1 Performance Criteria (A)

The side impact test shall be carried out on passenger cars, multi-purpose passenger vehicles, trucks and buses whose maximum vehicle weight does not exceed 4500 kg and the following performance criteria shall be met when testing the vehicle in accordance with Gulf standard indicated in item 2.3.

4.4.1.1 Each vehicle shall be able to meet the following with any seats that may affect load upon or deflection of the side of the vehicle removed from the vehicle.

4.4.1.1.1 The initial crush resistance

The initial crush resistance shall be more than 1020 kg.

4.4.1.1.2 The intermediate crush resistance shall be more than 1590 kg.

4.4.1.1.3 The peak crush resistance shall be more than twice the curb weight of the vehicle or 3175 kg whichever is less.

4.4.1.2 Each vehicle shall be able to meet the following with seats installed in the vehicle, and located in any horizontal or vertical position to which they can be adjusted and at any seat back angle to which they can be adjusted.

4.4.1.2.1 The initial crush resistance

The initial crush resistance shall be more than 1020 kg.

4.4.1.2.2 The intermediate crush resistance shall be more than 1985 kg.

4.4.1.2.3 The peak crush resistance shall be more than three and one half times the kurb weight of the vehicle or 5445 kg, whichever is less.

4.4.1.3 Vehicle with the following design parameters need not meet the requirements in items 4.4.1.1 or 4.4.1.2.

4.4.1.3.1 Any side door located so that no point on a 25.4 cm horizontal longitudinal line passing through and bisected by the H-point of a manikin placed in any seat, with the seat adjusted to any position and the seat back adjusted as specified in accordance with the Gulf standard mentioned in item 2.3; falls within the transverse, horizontal projection of the door's opening.

4.4.1.3.2 Any side door located so that no point on a 25.4 cm horizontal longitudinal line passing through and bisected by the H-point of a manikin placed in any seat, recommended by the manufacturer for installation in a location for which seat anchorage hardware is provided, with the seat adjusted to any position and the seat back adjusted as specified in accordance with the Gulf standard mentioned in item 2.3 falls within the transverse, horizontal projection of the door's opening.

4.4.1.3.3 Any side door located so that a portion of a seat, with the seat adjusted to any position and the seat back adjusted as specified in accordance with the Gulf standard mentioned in item 2.3, falls within the transverse, horizontal projection of the door's opening, but a longitudinal vertical plane tangent to the outboard side of the seat cushion is more than 25.4 cm from the innermost point on the inside surface of the door at a height between the H-point and shoulder reference point and longitudinally between the front edge of the cushion with the seat adjusted to its forwardmost position and the rear edge of the cushion with the seat adjusted to its rearmost position.

4.4.1.3.4 Any side door that is designed to be easily attached to or removed (e.g. using simple hand tools such as pliers and/or a screw driver from a motor vehicle manufactured for operation without doors.

4.4.2 Dynamic performance criteria for dummy (B)

When a passenger car, multipurpose passenger vehicle, light truck or bus whose maximum vehicle weight is less than 2722 kg with test dummies in the front and rear seats the following performance criteria shall be met when testing the vehicle in accordance with Gulf Standard indicated in item 2.4.

4.4.2.1 Thorax

The thoraxic trauma index (TTI) shall not exceed 85 g for a passenger car with four side doors and for multi-purpose passenger vehicle, truck or bus and 90 g for a passenger car with two side doors.

4.4.2.2 Pelvis

The peak lateral acceleration of the pelvis shall not exceed 130 g.

4.4.2.3 Any door which is not struck by the moving deformable barrier shall meet the following:

4.4.2.3.1 The door shall not disengage from the latched position.

4.4.2.3.2 The latch shall not separate from the striker, and the hinge components shall not separate from each other or from their attachment to the vehicle.

4.4.2.3.3 The latch and the hinge systems of the door shall not pull out of their anchorages.

4.4.3 Performance Criteria (C)

The side impact test shall be carried out on passenger cars, multi-purpose passenger vehicles, trucks and buses whose maximum vehicle weight does not exceed 3500 kg where the seating reference point of the lowest seat does not exceed 700 mm from the ground and the following performance criteria shall be met when testing the vehicle in accordance with Gulf standard indicated in item 2.5.

4.4.3.1 The head performance criteria (HPC) shall be no more than 1000; if there is no head contact, the HPC shall not be measured or calculated but recorded as “No Head Contact”.

4.4.3.2 For thorax:

4.4.3.2.1 Rib deflection criterion (RDC) shall be not more than 42 mm.

4.4.3.2.2 Soft tissue viscous criterion (VC) shall be not more than 1 m/s.

4.4.3.3 For pelvis:

The pubic symphysis peak force (PSPF) shall not be more than 6 kN.

4.4.3.4 The abdominal peak force (APF) shall be not more than 2.5 kN internal force (equivalent to external force of 4.5 kN).

4.4.3.5 No door shall open during the test.

4.4.3.6 After the impact, it shall be possible without the use of tools.

4.4.3.6.1 To open a sufficient number of doors provided for normal entry and exit of passengers.

4.4.3.6.2 To release the dummy from the protective system.

4.4.3.6.3 To remove the dummy from the vehicle.

4.4.3.7 No interior device or component shall become detached in such a way as to increase considerably the risk of injury from sharp projections or jagged edges.

4.4.3.8 Ruptures resulting from permanent deformation are acceptable; provided these do not increase the risk of injury.

4.4.3.9 If there is continuous leakage of liquid from the fuel-feed installation after the collision, the rate of leakage must not exceed 5 x 10^{-4} kg/s; if the liquid from the fuel-feed system mixes with liquids from the other systems and the various liquids cannot easily be separated and identified, all the liquids collected must be taken into account in evaluating the continuous leakage.

4.5 Roof strength

The maximum displacement of the tested part in the roof of passenger car, multi-purpose passenger vehicles, trucks, and buses of GVW less than 2722 kg (excluding convertible) shall not exceed 127 mm when subjected to a force equal to 1.5 times the kerb load of the tested car, or 22.24 kN, whichever is less.

5- SAMPLING

From the consignment of vehicles (of the same kind and model) a number suitable to the required tests shall be taken.

6- TESTING

6.1 Methods of Test

Testing shall be carried out in accordance with the following Gulf standards:

5.2.1 GSO 36/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 1: Frontal Impact”.

5.2.2 GSO 37/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 2: Moving Barrier Rear Impact”.

5.2.3 GSO 38/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 3A: Side Impact”.

5.2.4 GSO 39/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 4: Roof Strength”.

5.2.5 GSO 1707/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 3B: Moving Barrier Side Impact”.

5.2.6 GSO 1708/2005 “Motor Vehicles - Methods of Test for Impact Strength - Part 3C: Moving Barrier Side Impact”.

7- CRITERIA OF TECHNICAL CONFORMITY

The criteria of technical conformity mentioned in the Gulf Standard 48/1984 “Motor Vehicles - Conformity Certificates” shall be followed.

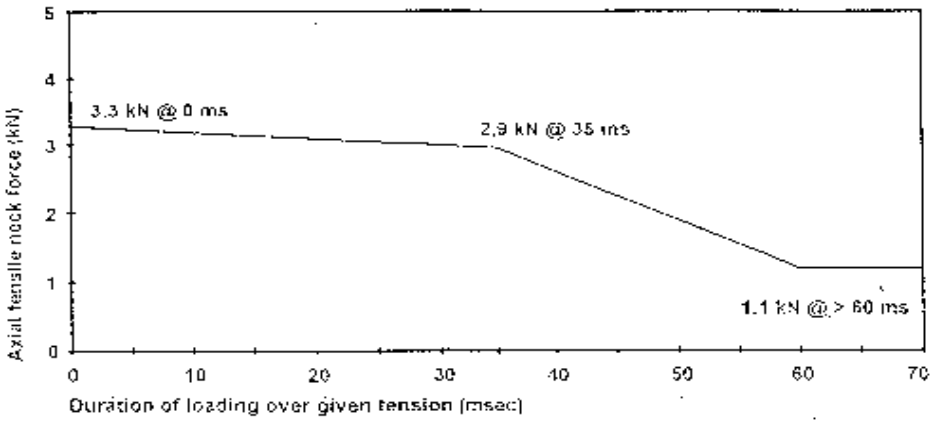

Figure 1
Neck Tension Criterion

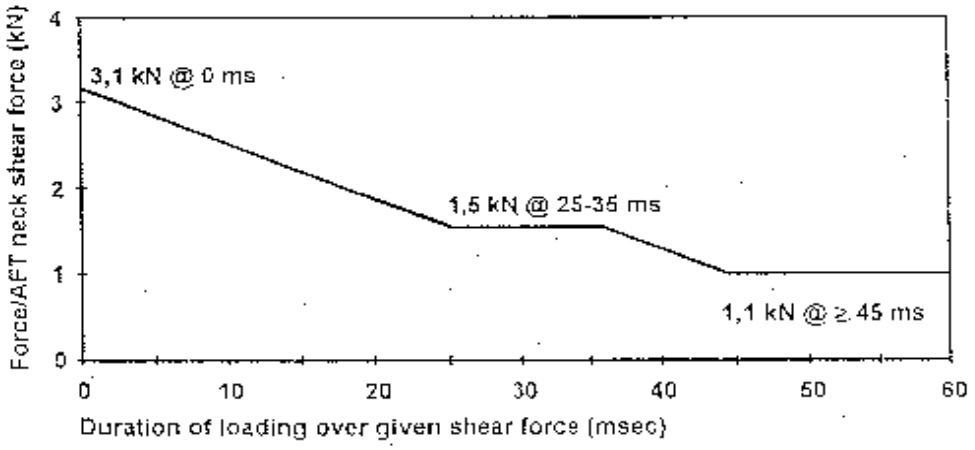

Figure 2
Neck Shear Criterion

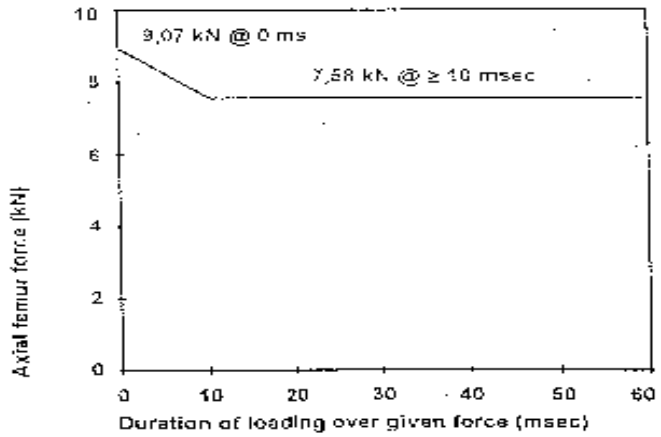

Figure 3
Femur Force Criterion